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Estimates of the Genuine Progress Indicator of Krasnoyarsk Krai

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The aim of the paper is to give the preliminary estimate of the Genuine Progress Indicator of Krasnoyarsk Krai. First of all, we considered the theoretical framework of assessment of complex public welfare of countries and their regions. Then we suggested an approach to the measurement of social, economic and ecological well-being of Krasnoyarsk Krai based on the original methodology of the Genuine Progress Indicator estimation. The preliminary estimates of the GPI of Krasnoyarsk Krai in 2005–2011 were given using the data available from official public sources. Our analysis showed that the GPI is at least 30–35 % lower than traditional GRP. This work should be continued with the estimation of GPI for other Russian regions.

Keywords: Genuine Progress Indicator, Gross Regional Product, public welfare, regional economics.

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1. Introduction

The Gross Domestic Product could not be treated as a comprehensive measure for the wellbeing of nations, even though it is widely used as a unique and main indicator of the progress throughout the world since 1940s. Despite it is a good estimator of economic progress, but also not a comprehensive one, it cannot be used for measuring the social progress and, probably, regress. It is also obvious that the GDP does not account for ecological issues, which are getting more and more important in recent time. On the contrary, a real ecological damage is reflected in the GDP as a positive outcome, since it always causes some economic activity intended for recovering of the consequences of such damage (Costanza et al., 2004). The same goes for other components of the true progress.

In 1995 C. Cobb, T. Halstead and J. Rowe have developed the indicator being capable to measure the genuine progress in economic, social and ecological spheres of life in 1995 (Cobb et al., 1995).

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Over the last decades, the issue of establishing of a comprehensive indicator of the nations' genuine progress became one of the main points of the current agenda even beyond the traditional field of economics. A recent work of Costanza et al. published in the famous and multidisciplinary journal Nature is the best proof (2014). The authors promote the excessive importance of replacement of traditional GDP by the GPI, Genuine Progress Indicator, which gives a rather richer image of what is really going on with economy, social sphere and natural environment on the specific territory (country or region). It is obvious that in the nearest future national and local governments should claim for the genuine progress measures.

The problem of sustainable development is of a great importance for Russia, but only academic society and small-numbered public institutions within the country acknowledge it. It is worth to mention the work of S. N. Bobylev and his colleagues who assessed a lot of indicators of sustainable development (e.g., Bobylev et al., 2013). The ecological aspects of interregional inequality of Russian regions were studied by I. P. Glazyrina, I. A. Zabelina and E. A. Klevakina (Glazyrina et al., 2010; Zabelina and Klevakina, 2011; Klevakina and Zabelina, 2012). The official Russian government recognizes this problem only in long-run perspective, so their main focus is put on rent seeking aimed to fulfill the current tasks of social and economic development (Pyzhev et al., 2014). The situation tends to change during last years, because the successful model of economic development based on high prices of oil and gas, which form half of the Russian budget, seems to be exhausted, so one needs to find some new sources of the economic growth. We urge that before making of a well-proven economic policy for the next decades, it is critically needed to create a good instrument of assessment of genuine progress of all components of human well being in Russia. In this paper we'll make the first step and propose a technique for such assessment on the regional scale that is based on the GPI methodology. Our study object is Krasnoyarsk Krai, a huge region in the center of Russia with highly developed industry of natural resources. Earlier we performed the assessment of the Genuine Savings indicator for Krasnoyarsk Krai in the second half of 2000s (Zander et al., 2010a, 2010b).

2. Theoretical Framework

Since the GPI has been developed by the scholars and not by some official international institutions, there is no consistent and canonical methodology of its calculation. It is also important to mention that it's not possible to establish a unified calculation technique for any country and regions, because all of them have sufficiently distinctive systems of statistical accounting. Despite that, there is a fluent literature presenting the results of calculation and comparison of GDP and GPI dynamics through countries (e.g., Jackson and McBride, 2005; Lawn and Clarke, 2008; Posner and Costanza, 2011) and within some specific regions (Hamilton, 1999; Costanza et al., 2004; Bagstad and Shammin, 2012). A meta-analysis of GPI and GDP dynamics across 17 major countries was performed by Kubiszewski et al. (2013). The only known study of post-soviet space countries genuine progress was made for Ukraine over time span between 2000 and 2007 (Danilishin and Vekilch, 2010). All of the cited studies used modifications of the previously formulated methodologies of GPI calculation depending on the data available for the specific country or region.

It is crucially important to note that the currently acting statistical systems of post-soviet countries do not provide enough data for comprehensive evaluation of the GPI according to the techniques used in Western countries (Ibid). This means that part of indicators needs

to be replaced by proxies, and some of them even excluded from the analysis. Undoubtedly, such assumptions decrease the quality of analysis, but in our opinion, even simplified GPI assessment could provide a useful knowledge of the real dynamics of genuine progress in Russia, its regions and neighbor countries.

In our study we use the so-called "Redefining Progress" methodology (Talberth et al., 2006) that updates the original methodology (Cobb et al., 1995). The calculation technique for the GPI is rather simple than obtaining of particular indicators. The Genuine Progress Indicator is an algebraic sum of 26 indicators with different signs depending on whether this indicator contributes with benefits or losses to the welfare of region.

It was mentioned earlier that Rosstat, the Russian Federal Service of National Statistics, provides not all indicators needed for GPI evaluation. We suggest the following techniques for assessing the components of the Genuine Progress Indicator for Krasnoyarsk Krai using the really available data (Table 1).

The *Personal Consumption* (column B) and *Income Distribution Index* or Gini Index (column C) could be obtained directly from Rosstat statistics. It is assuming that one should calculate column C taking the least Gini Index as a base (100 %). The *Weighted Personal Consumption* indicator is calculated directly using the formula.

Evaluation of indicators *Value of Household Work and Parenting* (column E) and *Value of Higher Education* (column F) is rather more complicated. The data needed to evaluate average time spent on household work and parenting is not included nor in official statistical collections, neither in survey questions list. It means that this indicator needs a further study for getting a reliable data on this topic. The higher education system suffers from soviet legacy leading to sufficient disproportions in structure of enrolment and the real requirements of labor market. The prices for education in quite prestigious universities are low (a full semester may cost one average month salary), so the higher education is accessible for almost everybody. As a result, almost all the high school graduates become the students of higher education institutions, but then work in totally different areas. In our opinion, for the time being it has no sense to evaluate the future value of higher education in Russia, because the students and their parents don't treat it as a long-run investment with high yield coefficient.

It is suggested to exclude the *Value of Volunteer Work* (column G), because such kind of social activity is not spread in Russia.

The indicator *Services of Consumer Durables* (column H) could be assessed through expenditures on some basic consumer durables. We suggest accounting automobiles, TV sets, computers and washing machines, which are the most necessary durable goods for households. The corresponding data is directly available from Rosstat. The Central Bank of Russia provides the interest rate data. Hereinafter we accept the life time of the durables listed above equal to 5 years, so the depreciation rate is set to 20 %.

The value of services of highways and streets (column I) is easily assessed using the data on annual expenditure of regional budget on road construction and maintenance. Since the data on net stock of road infrastructure is not available in Russia, then it is not needed to take the annual rates of depreciation of this asset. Consequently, the only adjustment one needs to make here is to take 75 % as benefit share of annual road services, assuming that 25 % of time spend on roads are for commuting (Ibid).

Public cost of crime could be captured only partially, because of lack of data. Our suggestion is to include two components, regional budget expenditures on crime prevention and evaluation of cost of human life losses, into indicator *Cost of Crime* (column J). The first component data

Table 1. Components of the Genuine Progress Indicator for the Krasnoyarsk Krai, Russian Federation

Column	Indicator	Sign	Calculation Technique
B	Personal Consumption		Rosstat indicator
C	Income Distribution Index		Gini index (Rosstat indicator)
D	Weighted Personal Consumption	+	B / C * 100
E	Value of Household Work and Parenting	+	Needs further investigation
F	Value of Higher Education	+	Needs further investigation
G	Value of Volunteer Work	+	Excluded
H	Services of Consumer Durables	+	[Sum of consumer expenditures on purchasing of consumer durables (automobiles, TV sets, computers and washing machines)] × ([Interest rate] + [Depreciation rate])
I	Services of Highways and Streets	+	[Regional budget expenditures on road construction and maintenance] × 75 %
J	Cost of Crime	−	[Regional budget expenditures on crime prevention] + [Number of crime victims] × [Estimate of human life value]
K	Loss of Leisure Time	−	Needs further investigation
L	Cost of Underemployment	−	Needs further investigation
M	Cost of Consumer Durables	−	Is not needed
N	Cost of Commuting	_	[Average commuting trip time] × 2 × [Number of employed people] × [Number of workdays during a year] × [Hourly wage]
O	Cost of Household Pollution Abatement	−	Needs further investigation
P	Cost of Automobile Accidents	_	[Number of automobile accident victims] x [Estimate of human life value]
Q	Cost of Water Pollution	_	[Regional budget expenditures on water protection and remediation]
R	Cost of Air Pollution	−	Needs further investigation
S	Cost of Noise Pollution	−	Needs further investigation
T	Loss of Wetlands	−	Needs further investigation
U	Loss of Farmland	−	Needs further investigation
V	Loss of Primary Forests and Damage from Logging Roads	_	[Change of forest land cover] × [Estimate of forest ecosystems services value]
W	Depletion of Nonrenewable Energy Resources	_	[Overall price of all treasures of the soil mined within the region]
X	Carbon Dioxide Emissions Damage	_	[Volume of carbon dioxide emission] × [Carbon Dioxide world market ton price]
Y	Cost of Ozone Depletion	−	Needs further investigation
Z	Net Capital Investment	−	[Net capital growth] − [Percent change in labor force] × [Stock of the capital of the previous year]

is available from statistics, but the second one needs some additional assessment. There are a lot of approaches to the assessment of human life cost, but only a few could be applied in Russia. In our study we use a very simple technique for that, multiplying the number of crime victims by 2 mln rubles, a sum that is officially stated as the insurance money for a victim of aircraft or car accident in Russia. Last years, there are a lot of evidences of paying this sum to the victims of resonant disasters (Aganbegyan, 2014).

The indicators *Loss of Leisure Time* (column K), *Cost of Underemployment* (column L) and *Cost of Household Pollution Abatement* (column O) could not be estimated, because they need additional sociological investigations of households.

Cost of commuting (column N) may be roughly assessed using the data of the All-Russian survey of quality of life performed by Rosstat in 2011. The interviewees reported that they spend from 35 to 50 minutes for a one commuting trip. The average is 42.5 minutes, or 85 minutes per day. This value is multiplying by number of employed people within a region, number of working days during a calendar year and average hourly wage.

Cost of automobile accidents (column P) may be assessed only partially. Theoretically, it consists of value of health damage and cost of wrecked or destroyed cars, but the only available data provide the information about number of victims of car accidents. We could use the same approach of human life evaluation discussed above.

For the indicator *Cost of water pollution* (column Q) we suggest using the data on regional budget expenditures as a proxy. This estimate only reflects the direct expenditures on water pollution reduction. A more precise evaluation may be based on the approach developed by E. V. Ryumina, when data on structure of elements emitted in water bodies (2009). The interesting results concerning influence of water and air pollution on human health are found by V. M. Gilmundinov et al. (2011, 2012).

Cost of noise pollution (column S) is quite difficult to assess, because no appropriate studies were conducted in this field in Russia. Losses of wetlands and farmlands (columns T, U) and cost of ozone depletion (column Y) are also difficult to be assessed, for the same reason.

The indicator *Loss of Primary Forests and Damage from Logging Roads* (column V) could be quantified multiplying change of forestland cover by the estimate of forest ecosystems services value. The last value is derived from the study of R. Costanza et al. (1997) after the appropriate compounding.

We use overall prices of all treasures of the soil mined within the region available in regional statistics as a proxy for the indicator *Depletion of Nonrenewable Energy Resources* (column W).

Carbon dioxide emissions damage (column X) could be evaluated using the approach developed in (Zander et al., 2010a, 2010b).

The indicator *Net Capital Investment* (column Z) is easy to assess using the original approach (Talberth, 2007).

It is important to stress out that presented approach is universal and could be applied not only to specific region (e.g., Krasnoyarsk Krai), but also to any Russian territory.

3. Data

The dataset of Krasnoyarsk Krai social, economic and environmental spheres indicators over time span between 2005 and 2012 has been used for testing of GPI calculation technique described above. The main part of indicators is obtained from collections (Regiony Rossii, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013). The budget expenditures on particular topics were derived directly from Krasnoyarsk Krai budget.

Primary data was nominated in thousands of rubles. The GPI and GRP are calculated in billions of rubles, the prices were discounted to 2011 rubles. Despite of presence of components data for 2012, the GRP and personal consumption data for this years were missing for the moment of paper preparation, so we were ought to exclude it from the final results.

The most comprehensive dataset covers period since 2009 when Rosstat started to observe a lot of new statistical indicators.

4. Results and Conclusion

The results of our assessment of Krasnoyarsk Krai Genuine Progress Indicator are presented on Fig. 1. For the comparison of GPI and GRP dynamics we combined both rows on the same graph. GRP started from 782 bln rubles in 2005 and reached 1,188.7 bln rubles in 2011. Our GPI estimate is rather lower: from 222.1 bln rubles in 2005 to 378.6 bln rubles in 2011. It means that GPI is at least 30–35 % lower than GRP. Last years of our scope (2010 and 2011) GRP is about 20–25 % of GRP. Such a huge gap may be explained with a heavy ecological load of Krasnoyarsk Krai. Since GPI is methodologically preferable for the assessment of true progress of region's well being, it's really time to leave GRP (GDP) behind, as a title of recent work says (Costanza et al., 2014).

It is important to note that our estimation of GPI seems to be lower than its actual value, because some of important indicators were missing or the data was not complete. Some estimates used for calculation were quite rough and need further justification. Major part of missing data covered the negatively impacting factors, so if they would have been accounted, the GPI will sufficiently decrease.

For the time being, there are 10 indicators out of 26 used in original GPI methodology that can't be assessed due to the lack of necessary data. We are confident that some of them, such as volumes of air and water pollutions, might be easily included into the current system of statistical observation, both on regional and federal levels. It is evident that the necessary primary data for their calculation is stored inside the Rosstat databases. The other part (underemployment surveys etc.) needs panel studies on some large samples, periodically revealed.

Our main conclusion is that one needs to continue investigations of Genuine Progress

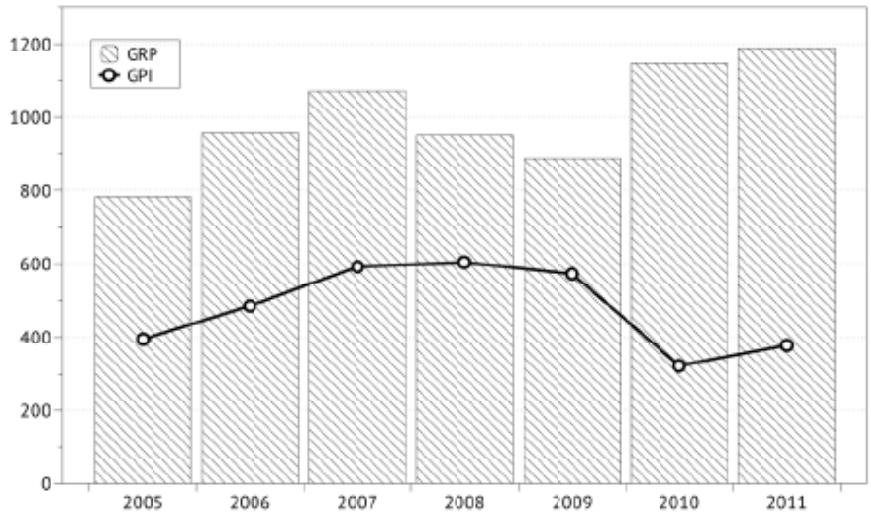

Fig. 1. GPI vs. GRP dynamics of Krasnoyarsk Krai, 2005–2011

Indicator across the Russian regions. As far as there will be necessary data for accurate evaluation of GPI, it will allow deeply understand the nature of interregional inequality and provide an important information for policy-makers.

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Оценка истинного показателя прогресса Красноярского края

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Целью настоящей работы является предварительная оценка истинного показателя прогресса (Genuine Progress Indicator) для Красноярского края. Рассмотрены основные известные результаты ведущих исследовательских коллективов в области комплексной оценки общественного благосостояния стран и их регионов. Предложен подход к измерению социального, экономического и экологического благополучия Красноярского края, основанный на методологии оценки истинного показателя прогресса. Проведена апробация предложенного подхода для оценки ИПП Красноярского края в 2005–2011 гг. с помощью данных, размещенных в открытых официальных источниках. Анализ показал, что ИПП как минимум на 30–35 % ниже, чем соответствующие значения ВРП. Работу по оценке ИПП следует продолжать для других российских регионов.

Ключевые слова: истинный показатель прогресса, валовый региональный продукт, региональная экономика, общественное благосостояние.

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